

# Exhibit C

# SUBJECT EXAMINATION PROGRAM

## CLINICAL SCIENCE EXAMINATION

### SCORE INTERPRETATION GUIDE



NBME® subject examinations provide medical schools with a tool for measuring examinees' understanding of the clinical sciences. Items on this examination were written and reviewed by national test committees. Prior to publication, test forms are reviewed by a panel of course directors from this discipline. Although these examinations are designed to be broadly appropriate as part of overall examinee assessment, course objectives vary across schools, and the congruence between subject examination content and course objectives should be considered when interpreting test scores and determining grading standards. Specifically, subject examination scores should not be used alone, but rather in conjunction with other indicators of examinee performance in determination of grades.

### Subject Examination Scores

The subject examination score is an equated percent correct score that represents mastery of the content domain assessed by the examination. It is calculated as the percentage of items in the total content domain that would be answered correctly based on an examinee's proficiency level. The subject examination scores are equated across test administrations and are statistically adjusted for variations in test form difficulty. Consequently, these scores can be used to compare and track school and examinee performance over time.

The subject examination scores are placed on a classic percent correct metric (0 – 100%) to facilitate interpretation and use. This scale can easily be incorporated into local assessments and grading schemes and provides a useful tool for comparing the scores of your examinees with those of a large, nationally representative group taking the examination as an end-of-course or end-of-clerkship examination.

### Precision of Scores

Measurement error is present on all tests, and the standard error of measurement (SEM) provides an index of the (im)precision of scores. The SEM indicates how far an examinee's score on the examination might stray from his/her "true" proficiency level across repeated testing using different sets of items covering the same content. Using the SEM, it is possible to calculate a score interval that will encompass about two thirds of the observed scores for a given true score by adding and subtracting the SEM from that score. For this examination, the SEM is approximately 4 points. If an examinee's true proficiency on the examination is 75, the score he/she achieved on the examination will usually (two times out of three) fall between 71 and 79 (75 - 4 and 75 + 4).

### Score and Performance Feedback

Summary information on the examinee group tested, examination purpose and number of items scored is provided on each page of the feedback. The [Roster of Equated Percent Correct Scores](#) reports a total test equated percent correct score for each examinee. Reported scores also appear in a comma separated text file that can be downloaded. An [Examinee Performance Profile](#), which graphically displays content areas of strength and weakness, is provided for each examinee.

If there were at least 2 examinees, [Equated Percent Correct Score Descriptive Statistics](#) for reported scores are provided along with a [Frequency Distribution](#) of the total test equated percent correct score. If there were at least 5 examinees for a single form administration, a detailed [Content Area Item Analysis Report](#) summarizing the general content of each item on the exam along with group item performance is provided. Content area item descriptors and group item performance also appear in a file that can be downloaded. If there were at least 5 examinees for a single form administration or 10 examinees for a multiple form administration, a [Summary Content Area Item Analysis Report](#) is provided.

If examinees were tested at your school in the previous academic year, a [Year-End Report](#) is provided. The report summarizes the performance of first-time takers and is posted annually in November to the [NBME Services Portal \(NSP\)](#).

# **SUBJECT EXAMINATION PROGRAM**

CLINICAL SCIENCE EXAMINATION

SCORE INTERPRETATION GUIDE



## **Grading Guidelines**

Grading guidelines for this exam have been developed by a nationally representative group of clerkship directors to assist schools and institutions in setting fair and valid passing and honors standards for students taking this exam. An abbreviated summary of the grading guidelines is provided and the full study with a list of participating schools is reported on NSP.

## **Norms**

Total academic year and quarterly norms are provided to aid in the interpretation of examinee performance. The norms reflect the performance of first-time taker examinees who took a form as an end-of-course or end-of-clerkship examination across an entire academic year and by quarterly testing periods. Quarterly norms have been provided because scores in some subject examinations are progressively higher for examinees of equivalent ability who take the relevant clerkship later in the academic year. This information may have particular relevance to schools that use the norm tables in the development of grading guidelines. The two most recent sets of norms that have been developed for this examination are provided for your convenience and are reported on the equated percent correct score scale. Norms will be updated in November to reflect the most recent academic year of data. Norms can also be found on NSP.



**SUBJECT EXAMINATION PROGRAM****CLINICAL SCIENCE EXAMINATION****GRADING GUIDELINES**

The NBME conducted webcast standard setting studies for the Clinical Neurology Subject Examination with medical school faculty from across the United States. For each study, medical school faculty who were past or present clerkship directors (79% for 2010 and 100% for 2017) in Clinical Neurology participated as expert judges in webcast sessions that utilized the internet and conference calling to train participants in the standard setting procedure. Judges reviewed the content and rated the difficulty of each item on a current form of the examination. The study employed both a Modified Angoff content-based procedure and the Hofstee Compromise standard setting method. These two procedures together provide proposed passing standards that are based on an in-depth item-by-item analysis of the examination content, as well as a more global analysis of the content. The results were summarized and the proposed standards were expressed as the proportion of the content required for a candidate to pass and to receive honors status. Table 1 provides a summary of the medical school faculty who served as expert judges and their school information for each of the webcast studies conducted by the NBME.

**Table 1 – Demographics of Expert Judges and Schools Participating in Clinical Neurology Webcast Studies**

Standard Setting Study	Number of Judges	Years of Experience	Number of Schools	Use AAN Curriculum	Traditional School Curriculum	Problem-Based School Curriculum	Integrated School Curriculum	School Clerkship Length
2010	14	1-23	14	N/A	21%	36%	21%	2-6 weeks
2017	9	2-29	9	78%	11%	11%	78%	3-6 weeks

\*American Academy of Neurology

The data shown below represent a compilation of the opinions of the medical school faculty who participated in each study. The results reported are on the new subject examination Equated Percent Correct score scale that became effective August 2015. The study results are provided to assist you in setting fair and valid passing and honors standards for this examination.

Table 2 provides a summary of the results for passing scores from the Modified Angoff and Hofstee Compromise procedures. The recommended minimum passing score based on the 2017 Angoff results is a subject exam score of 59, which is higher than the recommended standard in 2010. This score did fall within the acceptable range of minimum passing scores (55 to 64) computed from the 2017 Hofstee results, which suggest that any standard selected within this range would be reasonable. The recommended minimum passing score based on the 2017 Hofstee results is a subject exam score of 62, which is slightly higher than the 2010 Hofstee results.

**Table 2 – Clinical Neurology Grading Guidelines for Passing (Equated Percent Correct Scores)**

Standard Setting Study	Modified Angoff Recommended Passing Score	Hofstee Compromise Range of Acceptable Minimum Passing Scores	Hofstee Compromise Recommended Passing Score
2010	55	52 to 65	60
2017	59	55 to 64	62

Table 3 provides a summary of the Hofstee results for honors. The 2017 study results indicate that the minimum acceptable score for honors should fall between a score of 78 to 87. The 2017 range of acceptable Hofstee scores for honors has shifted upwards and is slightly higher than the 2010 results. The higher range for honors scores in 2017 is also consistent with the shift to higher recommended minimum passing scores based on the 2017 Modified Angoff and Hofstee results.

**Table 3 – Clinical Neurology Grading Guidelines for Honors (Equated Percent Correct Scores)**

Standard Setting Study	Hofstee Compromise Range of Acceptable Minimum Honors Scores
2010	75 to 85
2017	78 to 87

**SUBJECT EXAMINATION PROGRAM****CLINICAL SCIENCE EXAMINATION****YYYY-YYYY ACADEMIC YEAR NORMS****Interpreting Academic Norms**

- Norms are provided to aid in the interpretation of examinee performance.
- They make it possible to compare examinees' scores with the performance of a norm group.
- Norm group characteristics:
  - Examinees from LCME-accredited medical schools who took a form of this examination as an end-of-course or end-of-clerkship examination for the first time during the academic year from mm/dd/yyyy through mm/dd/yyyy.

**Quarterly Norms**

- The percentile ranks for each quarter are defined using the school reported start date of the first rotation for this subject.
- Using the start date of the first rotation, examinees are assigned to the appropriate quarter based on the assumption that their test date would be at least four weeks later.
- For example, if a school's start date for the first rotation is March, then the performance of examinees from that school that tested in April, May or June would be represented in the first quarter.
- Since quarterly norms are based only on schools that supplied the start date of the first rotation for this subject, the number of examinees reported across quarters may not add up to the total norm group for the academic year.

**Using the Table**

- Locate an examinee's score in the column labeled "Equated Percent Correct Score" and note the entry in the adjacent column labeled "Percentile Ranks" for the Academic Year or Quarterly testing period of interest. This number indicates the percentage of examinees that scored at or below the examinee's equated percent correct score.

**Equated Percent Correct Scores**

	Academic Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
<b>Number of Examinees</b>	14,214	3,604	3,058	3,377	3,573
<b>Mean</b>	80.5	79.5	80.5	81.0	81.2
<b>SD</b>	7.4	7.7	7.3	7.4	7.1

Equated Percent Correct Score	Percentile Ranks				
	Academic Year (n=14,214)	Quarter 1 (n=3,604)	Quarter 2 (n=3,058)	Quarter 3 (n=3,377)	Quarter 4 (n=3,573)
100	100	100	100	100	100
99	100	100	100	100	100
98	100	100	100	100	100
97	100	100	100	100	100
96	100	100	100	100	100
95	99	100	99	99	99
94	99	99	99	99	99
93	98	99	98	98	98
92	97	98	97	97	97
91	95	96	95	94	95
90	93	94	93	92	92
89	90	92	90	88	90
88	86	89	86	84	85
87	82	85	82	80	80
86	78	81	78	76	75
85	72	76	73	71	69
84	68	73	68	67	65
83	63	68	62	60	59
82	58	64	57	56	54
81	52	58	52	50	49
80	47	52	47	44	43
79	41	46	41	38	37
78	36	41	36	33	32
77	31	37	32	29	29
76	27	32	28	25	24
75	23	27	23	21	20
74	19	23	20	18	17
73	17	20	17	15	14
72	14	17	15	13	12
71	11	15	12	10	9
70	10	12	10	8	8
69	8	11	8	7	6
68	7	9	6	6	5
67	5	7	5	5	4
66	4	6	4	4	4
65	3	5	3	3	3
64	3	4	2	3	2
63	2	3	2	2	1
62	2	2	1	2	1
61	1	2	1	1	1
60	1	2	1	1	1
59	1	1	1	1	0
58	1	1	0	1	0
57	0	1	0	0	0
56	0	1	0	0	0
55	0	1	0	0	0
54 and below	0	0	0	0	0